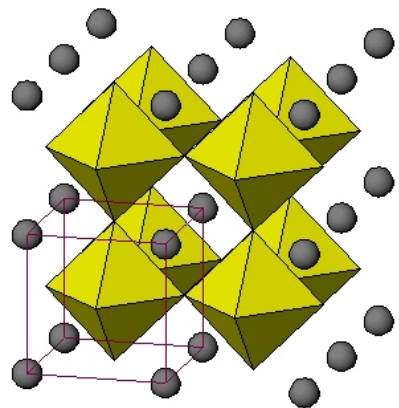
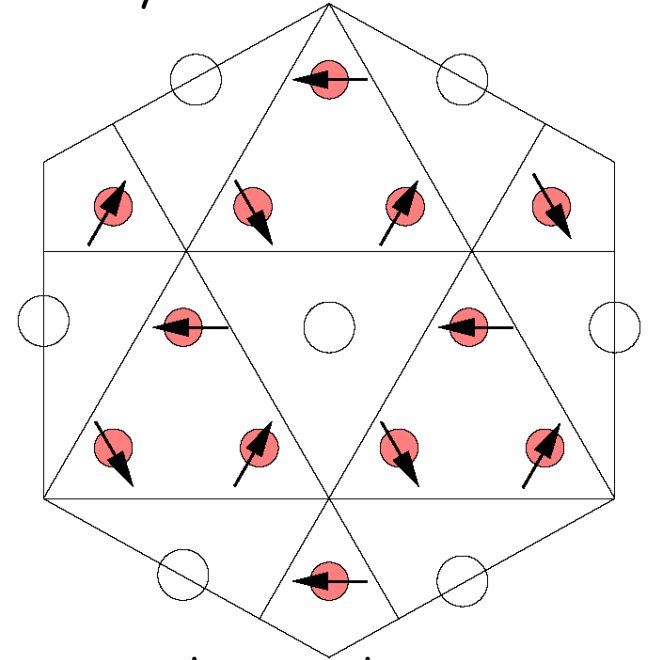


Dipole-ordering theory of "tilt" transitions in perovskite-type crystals

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Three bar magnets at vertices of an equilateral triangle will organize themselves to point parallel to the circumference of the corresponding circle. Similarly, bar magnets on the infinite triangular lattice (of which a fragment is shown at the right) will organize in the circular pattern shown.



This observation provides a new way to understand a common phenomenon seen in materials as diverse as earth minerals, high-temperature superconductors, and ferroelectric transducers - a tendency for the octahedral building block (shown to the left) to tilt, distorting the crystal structure at low temperatures. The distortion is stabilized by dipole interactions, just as in the bar magnet analog, but the dipoles here are electrical, caused by both displacement and induced polarization of the anions on the corners of the octahedron.